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APPLICATION FOR UNITED STATES LETTERS PATENT

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GRIPPER KIT FOR BOWLING BALL LIFT AND RETURN MECHANISM

CROSS REFERENCE TO RELATED APPLICATIONS

The present application claims priority to provisional application serial no. 60/414,178 filed on September 27, 2002, which is hereinafter incorporated in its entirety by reference.

DESCRIPTION

BACKGROUND OF THE INVENTION

Field of the Invention

The invention is directed to the lifting and handling of bowling balls, and, more particularly, to a gripper kit for improving a bowling ball lift and return mechanism that is suited for the lifting and handling of bowling balls covered with various amounts and types of oil.

Background Description

There are several types of conventional bowling ball return mechanisms used in modern bowling houses today. These generally include: vertical-type bowling ball return mechanisms and horizontal-type bowling ball return mechanisms. In the first type, a bowling ball is lifted from the pit area after delivery by the bowler and enters a runway some vertical distance above the bowling lane surface. The runway is inclined such that the bowling ball rolls down the incline before being returned to the bowler waiting at the opposite

end of the bowling lane. This, of course, requires that the bowling ball be vertically lifted and conveyed against the force of gravity. As such, a common feature of this type of ball return mechanism is the use of an endless belt and a set of track rails along which the bowling ball must be conveyed by a normalized frictional force that exists between the endless belt (on one side of the ball) and the track rails' outer surfaces (on the opposing side of the ball). In the second type, on the other hand, the bowling ball is retrieved from the pit area and conveyed in a generally horizontal path to a return before being propelled along a belt and track system to a bowler waiting at the opposite end of the bowling lane.

As is well understood in the art, the horizontal-type ball return mechanism offers numerous advantages over the vertical-type, to include elimination of the need to fight gravity in lifting and conveying the ball and the ability to return the bowling ball to the waiting bowler in less time. As such, the trend in the industry is to use this type in new or refurbished bowling houses. However, the vertical-type ball return mechanism has been in existence for a long time and remains in use in a large number of bowling establishments throughout the U.S. and the world at large. Accordingly, improvements to the vertical-type bowling ball return mechanisms remain desirable.

One of the difficulties experienced with any bowling ball return mechanism is the accumulation of oil on bowling balls and surfaces of the ball return mechanism that come into contact with the bowling balls. The trend in the bowling industry has been to apply more oil (lane conditioners) to the bowling lane surfaces, which complicates the handling of bowling balls in particular. This is especially true for the vertical-type bowling ball return mechanisms in which the ball, which can weigh as much as 16 pounds, must be lifted and conveyed against the force of gravity. A lack of frictional force caused by the accumulation of oil makes it difficult for the ball to be properly lifted in the vertical direction. This can lead to the so-called "yo-yo" effect in

which the ball rises up and down inside the vertical-type bowling ball return mechanism – sliding up and down the belt and track system and unable to make the climb necessary to be returned to the bowler.

Methods to address these issues include the development of new and improved bowling lane oils as well as the development of improved vertical-type bowling ball return mechanisms. An example of such an improved mechanism is the positive ball lift ("PBL") mechanism manufactured and sold by AMF Bowling Worldwide Products, Inc. ("AMF"). Such a mechanism generally includes an endless belt, which encompasses and is caused to turn by two diametrically-opposed pulleys that are connected by an internal frame, and a pair of track rails as shown in FIG. 1. During operation, the belt engages the spent bowling ball near the lower portion of the track rails. As the belt turns in a counterclockwise direction, the ball is intended to rise as it engages the track rails at the ball-entry area and rolls up and along the track rails to the ball-exit area. The predominant forces causing the ball to rise and to be propelled as desired are the frictional forces that exist between the outer surface of the belt and the outer surface of the track rails that face the ball. Obviously, the build up of excess oil on any of these surfaces or on the ball itself can hamper the operation of the ball return mechanism. Moreover, if the ball does not readily enter the channel created between the belt and the outer surface of the track rails, it will not be delivered as desired and could even become damaged. Either of these problems may ultimately require manual intervention and lead to undesirable delays in the bowling game.

An improvement to the conventional PBL ball return system includes the addition of one or two "humps" to the outer engaging surface of the endless belt such that the bowling ball would be wedged between and compressed by the hump on the belt and the adjoining track rail. This type of system is referred to as the "Hump Back Ball Return System". So long as the ball remains properly wedged in place, the hump back belt purports to provide

improved lifting capability due to the change in the ball-engaging surface of the belt. However, this requires the procurement of a specially made belt and the addition of the humps makes for a non-homogeneous belt surface that will degrade over time as it repeatedly turns around the pulleys during operation. Moreover, because the lifting capability of the PBL is only improved when the bowling ball is actually engaged by the humps (i.e., the ball must wait in the pit area until such time as the hump traverses around the lower pulley), the ball return is less than 100 percent efficient, which causes delays in returning the ball to the bowler.

Therefore, a need remains for an improved positive ball lift mechanism that ensures the bowling ball will properly enter the channel between the belt and the outer surface of the track rails and that it will be conveyed along the channel with minimal slippage.

SUMMARY OF THE INVENTION

In a first aspect of the invention, a gripper kit for installation on a ball lift bowling ball return mechanism having opposed pulleys connected by an internal frame structure, and track rails opposing the opposed pulleys is provided. The gripper kit includes an endless belt positioned about the opposed pulleys and track rail covers covering the track rails. Additionally, tapered thimbles guide and facilitate delivery of a ball into a channel formed between the endless belt and at least a surface of a portion of the track rail covers.

In another aspect of the invention, a gripper kit is provided for installation on a ball lift return mechanism having a frame structure and track rails opposing the frame structure. The gripper kit includes an endless belt positioned about opposed pulleys disposed on the frame structure and a tension bracket attaching a mechanical linkage to the frame structure. The tension

bracket has elongated slots for adjustment of position of a ball lift without removal of the tension bracket. A plurality of rail covers will cover the track rails and a mechanism for reducing a number of times a ratchet assembly actuates to lift a ball into a ball return entry area.

In another aspect of the invention, a ball return mechanism includes an internal frame structure and two opposed pulleys connected by the internal frame structure. An endless belt caused to turn by the two opposed pulleys is also provided. A pair of track rails opposes the endless belt. The pair of track rails includes rail track covers and the endless belt and the pair of track rails form a channel therebetween. Thimbles are provided at a lower portion of the pair of track rails and a lift arm assembly is attached proximate lower end portions of the track rails proximate to the thimbles. A mechanical linkage is attached to the internal frame structure through an upper support bracket having a series of elongated slots that provide adjustment capability of the upper support bracket and position of a ball lift without removal of the upper support bracket from the mechanical linkage and the internal frame structure.

BRIEF DESCRIPTION OF THE DRAWINGS

The foregoing and other objects, aspects and advantages will be better understood from the following detailed description of a preferred embodiment of the invention with reference to the drawings, in which:

FIG. 1 contains a schematic diagram of a conventional positive ball lift return mechanism.

FIG. 2 depicts a positive ball lift return mechanism with the addition of a gripper kit, in accordance with an embodiment of the present invention.

FIG. 3 depicts an endless belt that is part of the gripper kit for addition to a positive ball lift return mechanism in accordance with an embodiment of the present invention.

FIG. 4 depicts a tension bracket that is part of the gripper kit for addition to a positive ball lift return mechanism in accordance with an embodiment of the present invention.

FIG. 5 depicts a lower rail cover that is part of the gripper kit for addition to a positive ball lift return mechanism in accordance with an embodiment of the present invention.

FIG. 6 depicts an upper rail cover that is part of the gripper kit for addition to a positive ball lift return mechanism in accordance with an embodiment of the present invention.

FIG. 7 depicts four views of the ball guide assembly (thimble) of the gripper kit that includes a tapered form secured to an internal core part for addition to a positive ball lift return mechanism in accordance with an embodiment of the present invention.

FIG. 8 depicts an exploded view of the ball guide assembly (thimble) core that is part of the gripper kit revealing the tapered urethane (or other slip resistant material) form that is secured to the internal core for addition to a positive ball lift return mechanism in accordance with an embodiment of the present invention.

FIG. 9 depicts an exploded view of the components of the gripper kit that include an endless belt, an adjustable tension bracket, a pair of track rails in combination with the lower rail covers and the upper rail covers, and a pair of thimbles to be added to a positive ball lift return mechanism in accordance with an embodiment of the present invention.

DETAILED DESCRIPTION OF EMBODIMENTS OF THE INVENTION

The invention comprises a gripper kit designed for installation on an existing positive ball lift bowling ball return mechanism. The invention may

also comprise an improvement to an existing ball lift bowling mechanism, which constitutes an improvement to the vertical-type ball return mechanism such as shown in FIG. 1. The mechanism (without the addition of the gripper kit) includes an endless belt 10, which encompasses and is caused to turn by two diametrically-opposed pulleys 20 that are connected by an internal frame structure 30, and a pair of track rails 40, which are metal rods with a tacky material exterior covering to provide additional friction, that terminate in a pair of ball guides 50. Attached behind the lower end portions of the track rails 40, where the ball guides 50 are located, is a lift arm assembly 60 that is curved upward and lifts the ball into the channel that is formed between the outer lower surface of the belt 10 and the upper outer surface of the track rails 40. Position of the ball lift is maintained through a mechanical linkage 70 that is attached to the internal frame structure 30 through an upper support bracket 80. The direction of travel of the bowling ball from the pit area towards the upper pulley is indicated by the arrow in FIG. 1.

Now referring to the invention, by addition of the gripper kit, the belt 10 is replaced by a specially formulated gripper belt 100, the upper support bracket is replaced by an adjustable tension bracket 800, the track rails 400 are covered by a specially formulated material 410 and an upper, curved portion thereof at the ball-exit area is covered by a rubber material 420, and the ball guides 50 at the ball-entry area are replaced by thimbles 500 (see FIG. 8). All remaining components that are numbered and depicted as they appear in FIG. 1 remain the same. See FIG. 2 for a depiction of the improved positive ball lift bowling ball return mechanism containing components of the gripper kit of the invention. Again, the arrow in FIG. 2 represents the direction of travel of the bowling ball as it engages the ball return mechanism. Each component of the gripper kit is now described in turn.

Belt

Shown in FIG. 3 is the belt 100 to be used in an embodiment of the invention. An example of such a belt 100 is the endless belt manufactured by the Gates Corporation, part number 088001233. Such a belt has been specially developed for bowling applications and comprises a special formulation of neoprene rubber that exhibits enhanced and long-term frictional properties and hardness characteristics and is designed for high levels of ball contact and improved crack and wear resistance. Other belts that meet the specifications of the Gates belt could be used and are to be considered within the scope of the present invention.

Tension Bracket

The improved tension bracket 800 is depicted in FIG. 4 as contemplated in the invention. The improvement comprises introduction of a series of elongated slots 810 that provide adjustment capability for the bracket's position to allow position of the ball lift to be adjusted without the need for removal of the bracket 800 from the mechanical linkage 70 and the internal frame structure 30.

Track Rail Covers

The track rails 400 to be used in the embodiment of the invention comprise a pair of circular rods, preferably made of metal such as steel, aluminum or titanium, with each rod being enclosed by a lower rail cover 410 (see FIG. 5) and an upper rail cover 420 (see FIG. 6). These rail covers serve to enhance the friction between the bowling ball, which is coated with oil that accumulates during the bowling game, and the outer surface of the endless belt 100. Shown in FIG. 2 is an assembled view of the track rails 400 including the lower rail covers 410 and the upper rail covers 420.

Each rail cover 410 and 420 is fabricated to length and each, in an embodiment, has a cross section to allow it to be fitted onto its corresponding track rail. In the embodiment, the lower rail covers 410 are comprised of a specially formulated urethane material manufactured by a proprietary method. Other material types that can provide similar frictional characteristics and durability are acceptable and should be considered within the scope of this disclosure. Obviously, the lifting and conveyance of the bowling ball is enhanced by the frictional properties of these surfaces. The lower rail covers 410 are primarily intended to cover the mid to lower extremities of the track rails 400 while the upper rail covers 420, which are manufactured from a conventional neoprene rubber material, are intended to cover the curved portion of the track rails 400 at the ball-exit area.

As neoprene rubber is available at a much lower cost than urethane, the two piece rail cover design was used to reduce the overall cost of the gripper kit. In one embodiment, as the formulated urethane has better friction properties than neoprene rubber, it is used at the lower portion of the track rails where slipping problems are the most critical. It is the lower portion of the track rails where the "yo-yo" effect can occur. Thus, it should also be considered within the scope of this disclosure that one piece or multi-piece construction of the track rail cover can be used for each track rail 400.

Ball Guides

The lower extremities of the track rails 400 are fitted with thimbles 500 as shown in FIG. 2. These ball guides 500 are intended to help guide the bowling ball into the ball-entry area so it can enter the channel between the endless belt 100 and the outer surface of the rail covers 410 and 420 for conveyance along the channel with minimal slippage. In an embodiment of the invention, the thimbles 500, as depicted in FIGS. 7 and 8, comprise specially-shaped and tapered outer covers that are secured to and enclose internal core

structures 510. Preferably, each internal core 510 is made of metal and the outer covering 520 is secured to the internal core 510 by bonding; however, other mechanical means of attaching these components, such as by threaded fasteners, are within the scope of this disclosure. Also within the scope of this disclosure would be a similar multi-piece or one piece construction thimble. Experience with the conventional positive ball lift ball return mechanism reveals that the shape and surface texture of the thimbles 500 at the lower extremities of the track rails 400 play a significant role in the effectiveness of the ball return in lifting and conveying the bowling ball along the track rails. The urethane material of the thimble provides a significant resistance to slippage of a bowling ball entering the lift. The conical construction of the thimbles helps to center a bowling ball which has entered the lift. It also aids in the smooth transition of a bowling ball moving from the thimble to the track rail covers.

The urethane material provides sufficient surface friction so that the ball can enter the ball return yet it is flexible enough to avoid damaging the ball while providing sufficient stiffness and resilience to be long lasting over multiple cycles. Other materials that provide similar material properties to urethane are acceptable and should be considered within the scope of this disclosure.

Because the thimble 500 is round, with a shape and cross section comparable to the lower rail cover 410 that encloses the track rail 400, it offers multiple wear areas due to the fact that it can be loosened from the assembly, rotated, and retightened. The thimbles occupy a larger volume than do the ball guides used on the conventional PBL ball return, which reduces the available space for bowling pins to enter the ball return, lowering the number of pin jams experienced in the ball return area. Moreover, thimbles create a smooth and immediate action of the ball into the ball return entry area, shortening the time it takes for the ball to return to a waiting bowler and reducing the number of

times the ratchet assembly of the PBL ball return must actuate to lift a ball into the ball return entry area. This saves wear and tear on the ratchet assembly as well as on the Light Ball Sensor assembly (also manufactured and sold by AMF).

Shown in FIG. 9 is an exploded view of the components of the gripper kit to be added to a positive ball lift return mechanism in accordance with an embodiment of the invention. These components include the endless belt 100, the adjustable tension bracket 800, the thimbles 500, as well as the lower rail covers 410 and the upper rail covers 420 for enclosing the track rails 400 (FIG. 2).

By implementing the invention, entry of the ball into the channel between an endless belt and the outer surface of track rails can be conveyed with minimal slippage. The components are additionally capable of being retrofitted to existing positive ball lift bowling ball return mechanisms with ease of assembly and without requiring replacement of the mechanism. The invention also facilitates accurate and efficient entry of the bowling ball into the channel between the endless belt and the outer surface of track rails.

While the invention has been described in terms of embodiments, those skilled in the art will recognize that the invention can be practiced with modification within the spirit and scope of the appended claims.